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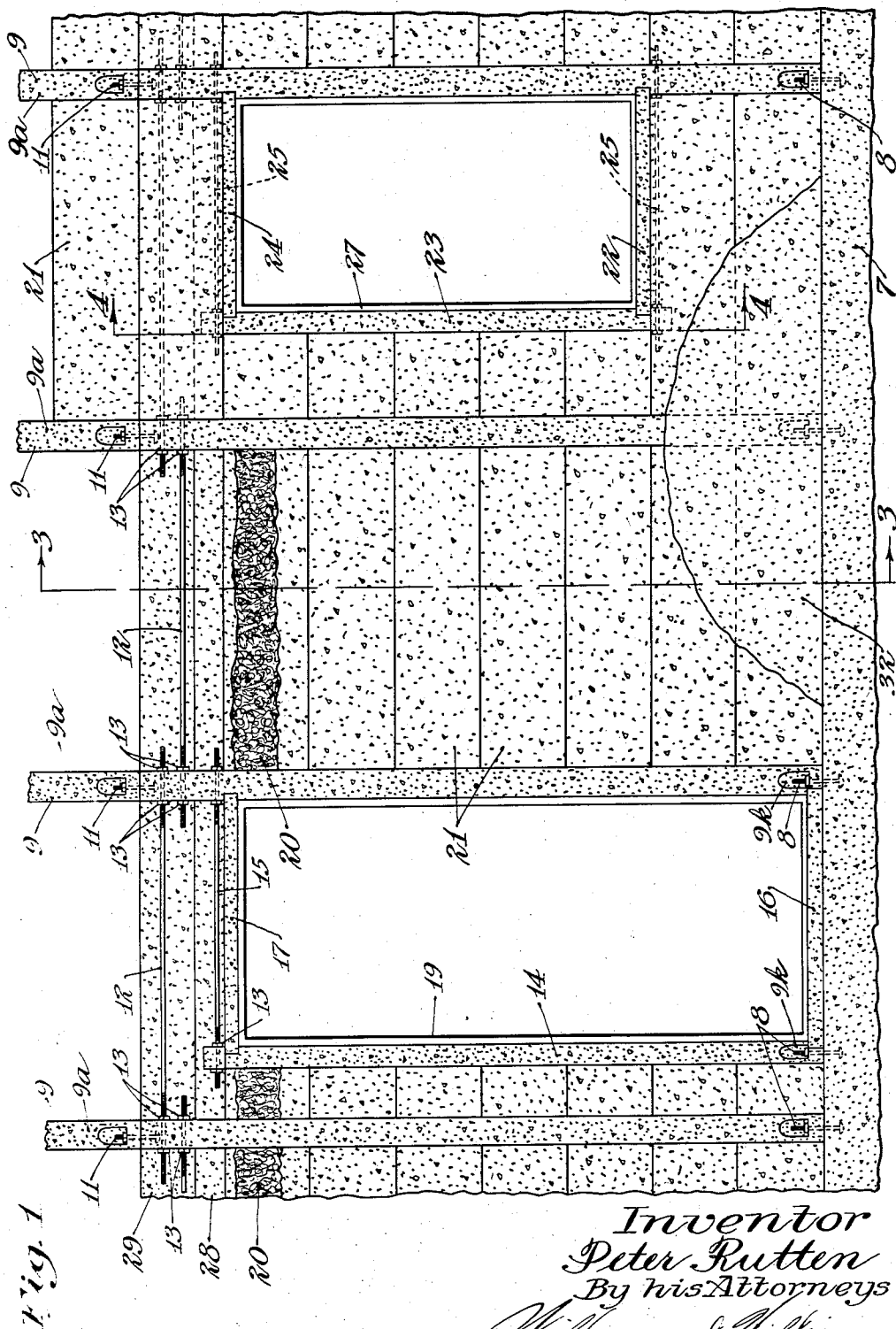
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BUILDING UNIT AND STRUCTURE

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BUILDING UNIT AND STRUCTURE

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6 Claims. (Cl. 72-16)

This invention relates to precast building units and building structures constructed therefrom.

It is the general object of this invention to provide novel and improved building structures, which can be quickly and easily set up by unskilled labor from precast building units made chiefly from plastic material such as concrete.

It is another object to provide novel and improved building units for use in producing such building structures.

To these ends, generally stated, the invention consists in the novel parts and novel combinations of parts hereinafter defined in the claims and described in the following specification, wherein like reference characters refer to the same or similar parts throughout the various views, and, in which,

Fig. 1 is a view in front elevation of a portion of a house constructed in accordance with the present invention, certain of the parts being broken away to more clearly show the construction of other parts;

Fig. 2 is a horizontal section taken through a portion of a wall of a house embodying the invention;

Fig. 3 is a vertical section taken on the line 3-3 of Fig. 1 in the direction indicated by the arrows;

Fig. 4 is a vertical section taken on the line 4-4 of Fig. 1, as indicated by the arrows, the tenons of certain of the wall slabs not being illustrated;

Fig. 5 is a horizontal section taken through one of the studs used in building the house, portions of which are illustrated in Figs. 1 to 4; and

Fig. 6 is a horizontal section taken through one of the corner posts used.

The various building units of the present invention will be described as they are used in building a house. The manner of assembly of these units will be described as the building of the house progresses.

Referring to the drawings, a concrete foundation wall 7 for the house to be constructed, is first built in the usual manner. Vertically extending bolts 8 are inserted within this foundation wall 7 at spaced intervals, while the concrete of the wall is still unhardened and these bolts project upwardly for some little distance above the top of the wall. These bolts are placed at intervals corresponding to the spacing, center to center, of studs to be later used in constructing the house. Also bolts are inserted in the foundation wall at other points for use in connection with doorway studs and corner posts. After the foundation wall 7 with the bolts 8 projecting upwardly therefrom has been erected and allowed to set and harden,

studs 9 and corner posts 10 are erected on the foundation wall, these studs and corner posts being used in connection with the construction of the wall of a first floor of the house.

Each stud 9 is a preformed unit, constructed before it is taken to the building site. Each stud includes an outer bar or section 9a of generally rectangular shape in horizontal cross section, as best shown in Fig. 5, and constructed from concrete or other plastic material preferably suitably reinforced as by a reinforcing rod 9b. Each stud also includes an inner bar or section 9c of generally rectangular shape in horizontal cross section, but preferably of somewhat less thickness from front to rear surfaces than the bar 9a. This second bar 9c is also constructed from concrete or other plastic material, preferably suitably reinforced, as by a reinforcing rod 9b. The front surface of the inner bar 9c is spaced a short distance from the rear surface of the outer bar 9a and between these two surfaces there is placed a strip 9d of insulating material. The two bars 9a and 9c and the strip of insulating material 9d are secured together as by means of ties 9e embedded in the bars 9a and 9c and projecting through the strip 9d. The strip 9d is of somewhat narrower width than the width of the two bars 9a and 9c to form longitudinal grooves 9f in the sides of the stud. Oppositely disposed longitudinal grooves 9g are formed in the sides of the bar 9a, while similar oppositely disposed longitudinal grooves 9h are formed in the sides of the bar 9c. The grooves 9f are, of course, located intermediate the grooves 9g and the grooves 9h at each side of the stud. In the back surface of the stud intermediate the sides of the same there is provided a nailing strip 9j which preferably is inserted in place within the bar 9c at the time that the bar is molded, so that the rear surface of the strip lies flush with the rear surface of the bar 9c. Near the lower end of the stud 9, there is provided a recess 9k formed in the outer bar 9a and this recess projects rearwardly from the front face or surface of the bar 9a. A bolt opening 9l projects through the lower end of the bar 9a from the bottom of the recess 9k to the bottom end of the stud. Mounted in the upper end of the bar 9a of the stud is a bolt 11 which projects upwardly for some distance above the upper end of the stud. A short distance below the upper end of the stud, a pair of vertically spaced rod receiving openings 9m extend transversely through the bar 9a.

Each corner post 10 is of square shape in horizontal cross section as best shown in Fig. 6. Each

post 10 includes an outer pillar or section 10a having four sides set at right angles to each other and a fifth diagonal side extending at approximately a 45° angle to two of the sides of the pillar. This pillar is preferably cast from concrete or similar plastic material and is preferably reinforced as by reinforcing rods 10b. The post 10 also includes an inner smaller pillar 10c of substantially triangular shape in horizontal cross section. The outer surface of this inner pillar 10c is spaced from the diagonal side of the outer pillar 10a and a strip 10d of insulating material is located between the two pillars. The two pillars 10a and 10c and the strip 10d are secured together by ties 10e embedded in the pillars and projecting through the strip. The edges of the strip 10d are so cut and the inner or joining sides of the post where the edges of the strip 10d appear are so formed as to afford longitudinal grooves 10f therein. Outwardly from the grooves 10f, longitudinal grooves 10g are formed in the same sides of the post in the pillar 10a, while inwardly from the grooves 10f longitudinal grooves 10h are formed in the same sides of the post in the pillar 10c. Near the lower end of the post 10, a recess 10j is provided, cut inwardly from the outer corner of the post in the pillar 10a and a bolt opening 10k projects from the bottom of the recess 10j to the bottom end of the post. Preferably one or more bolts similar to the bolts 11 are embedded in the upper end of the pillar 10a of the post to project above the same. Spaced vertically from each other and also spaced vertically short distances from the upper end of the post 10, two rod receiving openings 10l are provided in the pillar 10a and these openings are set at right angles to each other and run parallel respectively with the outer surfaces of the pillar 10a.

In erecting the studs 9 and posts 10 on the foundation wall 7, the bolts 8 at the corners of the foundation wall are run through the bolt openings 10k of the posts 10, while other bolts 8 are run through the bolt openings 9k of the studs 9. Nuts are then threaded on the upper ends of these bolts and screwed downwardly against the bottoms of the recesses 10j and 9k to securely anchor the lower ends of the posts and studs. Horizontal tie rods 12 are now run through horizontally aligned rod receiving openings 9m of adjacent studs 9, as best shown in Fig. 1 and these rods are secured to the studs by means of oppositely disposed nuts 13 screwed onto the rods. The studs are of course, plumbed so that they stand in true vertical relation as the nuts 13 are tightened up. It will be noted that consecutive rods 12 taken horizontally of the wall are located at different levels. Similar rods 12 extend from the studs 9 adjacent the corner posts 10 between the studs and posts and these rods run through the rod receiving openings 9m of the studs and the rod receiving openings 10l of the posts. The posts and studs are accordingly tied together near their upper ends by means of the tie rods 12.

Where a door is to be formed in the wall of the house, a stud 14 similar in most respects to the studs 9 but of somewhat shorter length, is erected on the foundation wall 7 by attachment thereto by means of one of the bolts 8 and this stud may be connected near its upper end to an adjacent stud 9 by means of a shorter rod 15 running through the stud 14 adjacent its upper end and through a prepared rod receiving opening located at the proper level in the adjacent stud 9. The stud 14 will of course form one rough jamb of the door frame, while the stud 9 connected to

the stud 14 by the rod 15 will form the other rough jamb of the door frame. Opposing faces of these two studs at their lower ends are rabbeted to receive a precast concrete slab 16 forming the threshold of the rough door frame and the stud 14 adjacent its upper end and the opposing stud 9 at the same level are notched to receive a precast concrete slab 17 forming the lintel of the rough door frame. The grooves 9h of the stud 9 forming one jamb of the door frame, which grooves oppose the stud 14, and the corresponding grooves of the stud 14 are filled by nailing strips 18 and a wooden door frame 19 is secured to the rough door frame by means of nails or other securing means driven into or otherwise attached to these nailing strips.

With the studs, corner posts and door in place, the skeleton frame work for the first floor of the house is substantially completed. The next step in erecting the house is to construct the walls. Panels 20 of insulating material cut to proper size to extend between the various studs and corner posts are now inserted in place within the upper portion of opposing grooves 9f of adjacent studs and within the grooves 10f of the posts 10 opposing the grooves 9f of adjacent studs and these panels 20 are slid downwardly in these grooves so that the lowermost panels rest directly on the foundation wall 7 and succeeding panels rest on panels immediately below the same. These various panels together with the strips 9d and 10d of insulating material form a complete wall of insulation for the building. Precast concrete panels 21 having tenons at their ends and of proper length to fit between the various studs and between the studs and the posts 10 are next inserted in place within the upper portions of opposing grooves 9g and 9h of the studs and the grooves 10g and 10h of the posts 10 and these concrete panels are slid downwardly in the grooves so that the lowermost panels rest directly on the foundation wall 7 and succeeding panels rest on panels immediately below the same. It will be seen that the panels 21 when fitted in place, form spaced parallel inner and outer walls and the dead air space between the inner and outer walls formed by the panels 21 between adjacent studs or between adjacent studs and posts, is divided into two air chambers by means of the wall of insulation formed by the insulating panels 20. If windows are desired in the house, provision may be readily made for the same as the panels 20 and 21 are laid in place. If, for example, it is desired to locate the sill of a window at a horizontal level immediately above the two lowermost groups of concrete panels 21 and the two lowermost insulating panels 20 between two of the studs 9, as shown in Fig. 1, and as also shown in Fig. 2 and Fig. 4, a precast concrete slab 22 forming a window sill is laid between the two desired studs 9 and one of the studs, as the extreme right hand stud shown in Fig. 1, is notched to receive the end of this window sill slab. A portion of the stud 9 which receives the slab 22 may then be used as one jamb of the rough window frame, whereupon another jamb 23 of very similar construction to the stud 9 may be erected in proper spaced relation from the jamb stud. The jamb 23 is notched adjacent its two ends to receive the window sill slab 22 and a window lintel slab 24 having one end received within a notch of the jamb stud. The jamb 23 above and below these two notches is made of reduced thickness to fit between the spaced parallel concrete panels 21, as best shown in Fig. 4. The jamb 23

is secured to the jamb stud 9 by means of tie rods 25 which run through properly provided rod openings in the jamb 23 and rod openings formed in the jamb stud 9 at the correct levels. Nailing strips 26 are provided in the grooves 9g and 9h of the jamb stud 9 between the two slabs 22 and 24 and similar strips are provided in the side of the jamb 23 facing the jamb stud 9. A wooden window frame 27 may be secured in the rough window frame thus produced as by nailing the same or otherwise securing the same to the strips 26.

Of course, where doors or windows are provided in the wall of the house, concrete panels 21 and panels 20 of insulating material of shorter lengths than the ordinary panels between the studs will be used.

After the wall of the house is laid to reach a level slightly below the upper ends of the studs 9 and posts 10, precast concrete beams 28 of less height than the panels 21 and of greater thickness than these panels are laid at a common level on the then uppermost inner panels 21. These beams 28 are provided at their ends with tenons which fit within the various grooves 9h and 10h and they are used to support any suitable type of floor 29 that may be desired. The floor 29 illustrated in Fig. 3 of the drawings is a concrete floor, but in practice I expect to use a floor construction similar to that disclosed and claimed in my pending United States application for patent entitled "Building units and constructions made therefrom", filed simultaneously with the present application. Outward from the flooring 29 and the beams 28, the insulating panels 20 and concrete panels 21 will be used to bring the level of the outer walls of the building flush with the upper surface of the flooring 29 and with the upper end of the studs 9 and the posts 10. The second story of the building can then be erected in much the same manner as the first story by attachment of further studs 9 and posts 10 to the bolts 11 mounted in the upper ends of the first story studs and posts.

If it is desired to provide additional insulation for the house, sheets 30 of insulating material may be nailed or otherwise secured directly to the nailing strips 9j of the studs 9, whereupon plaster 31 may be applied in the usual manner over the insulating sheets. Preferably before the insulating sheets 30 are applied, both the inner and outer walls formed by the concrete panels 21, are sealed at all joints by cement grouting which is applied with a broom or brush. If stucco is to be applied to the exterior wall of the house, it is not necessary to seal the joints of this exterior wall by grouting, inasmuch as when the stucco coating 32 is applied this coating of itself will seal the various joints between the different units in the exterior walls. Preferably the stucco coating 32 is used but, if desired, any type of exterior finish may be used for the house. If it is desired to apply wood siding to the exterior walls of the house, preferably nailing strips will be provided in the studs 9 on the exterior surfaces thereof at the time that the studs are cast (not illustrated).

The roof of the house may be applied in any desired manner, in accordance with good practice. If desired, special precast floor strips 33 made from concrete may be used in finishing off the interior of the house.

It will be seen that by use of the prepared precast building units, a complete building can be constructed in a very short time by unskilled

labor. Practically the entire structure is fire proof, the building has great strength to resist storms and the walls are thoroughly insulated, both against heat and cold. The building is inexpensive to produce and inexpensive to assemble. Any number of designs may be made. Inside load bearing partitions can be built in a manner similar to the manner of building the walls of the structure, or any suitable type of partition may be used.

With the wall construction provided, no mortar of any kind need be used until after the complete wall is set up. No poured concrete need be used nor forms of any kind required. Although the studs are cast as single units and the corner posts are cast as single units, the different inner and outer sections of the studs and posts are separated by insulating material and a separated double wall structure of concrete is thus provided through which heat units cannot readily pass. There is thus practically no possibility of condensation of moisture on the inside of the wall because the differences in temperature of the air at the inner side of the inner concrete wall and in the air space between the insulating panels 20 and the inner concrete wall can be but slight. In addition to the high thermal insulating properties of the building construction, the walls also have the property of deadening passage of sound therethrough to a high degree.

Although the building units of my invention are particularly adaptable for the construction of residential houses, office buildings, factories and buildings of all types may be made by the use of the same.

It will, of course, be understood that various changes may be made in the form, details, arrangements and proportions of the various parts and in constructions made from the various building units without departure from the scope of the present invention.

What is claimed is:—

1. A building construction comprising a plurality of spaced parallel, precast vertical studs formed chiefly of concrete, said studs each comprising two concrete sections facing each other, a strip of insulating material disposed between said two sections and ties interconnecting said sections and strip, each of said sections having sides within which spaced parallel longitudinal grooves are formed and slabs of precast concrete slidably fitted within opposing grooves of adjacent studs to form double walls insulated from each other by a dead air space.

2. A building structure comprising a plurality of vertically disposed precast studs horizontally spaced from each other, each of said studs comprising two concrete sections disposed in closely spaced parallel relation and a strip of insulating material disposed between said two sections, and means tying said sections and said strip together, said strip being of slightly narrower width than the two sections to form medial longitudinal grooves in the sides of said studs, each of said sections also having outer and inner longitudinal grooves in its side surfaces, panels of insulating material extending between adjacent studs and fitting at their ends within said first mentioned grooves to form intermediate insulating walls between the studs and panels of precast concrete extending between adjacent studs and received within said last mentioned grooves of said studs to form outer and inner concrete walls between adjacent studs.

3. A building construction including a plurality

- of spaced vertical precast studs, one of said studs forming one jamb of a rough frame, a precast jamb generally similar in construction to said studs and disposed in spaced relation from said stud forming said first mentioned jamb, means for anchoring the lower ends of said studs and said last mentioned jamb, a tie rod extending between the upper portion of said last mentioned jamb and a portion of said first mentioned jamb and horizontally precast concrete slabs vertically spaced from each other and forming respectively the cross members of a frame and extending between said two jambs, said two jambs having notches formed therein receiving the ends of said slabs.
4. In a building made from precast units, a plurality of vertical precast studs, precast vertical corner posts, precast concrete inner and outer panels disposed in tiers and extending between adjacent studs and between posts and studs adjacent thereto, said studs and posts having longitudinal grooves formed therein and slidably receiving the ends of said panels, means for anchoring the lower ends of said studs and posts and spacing and tie rods running between the upper portions of adjacent studs and between posts and studs adjacent thereto, each stud and each post including inner and outer precast concrete sections, a strip of insulating material placed therebetween and ties securing together said sections and strip, and panels of insulating material interposed between inner and outer precast concrete panels and extending between adjacent studs and between posts and studs adjacent thereto, the studs and posts being constructed to receive said panels of insulating material in such manner that the ends of said panels of insulating material abut the edges of said strips of insulating material.
5. A building structure comprising a foundation wall, bolts anchored in and projecting upwardly from said wall at horizontally spaced points, corner posts projecting upwardly from said wall at the corners thereof and fastened at their lower ends by certain of said bolts to said wall, said posts being formed chiefly of precast concrete, vertical studs horizontally spaced from said posts and from each other and projecting upwardly from said foundation wall, said studs being secured to said foundation wall at their lower ends by certain of said bolts, spacing and tie rods running between the upper portions of adjacent studs and between posts and studs adjacent thereto, said studs and posts having spaced inner and outer longitudinal grooves disposed in spaced parallel relation formed in their sides facing other studs and posts, precast concrete panels extending between adjacent studs and between posts and studs adjacent thereto and slidably fitted at their ends within said grooves in tiered arrangement to form with the studs and posts inner and outer walls, precast concrete beams resting on said inner walls and extending between adjacent studs and also between posts and studs adjacent thereto and a flooring supported by said beams, said posts and studs each comprising two precast concrete sections spaced from each other, a strip of insulating material disposed between the two sections and cooperating with the sides of respective posts and studs to form longitudinal grooves therein, and ties securing said sections and strip together and panels of insulating material disposed between adjacent studs and between posts and studs adjacent thereto and fitting at their ends within said last mentioned grooves to cooperate with said strips and thereby form walls of insulating material.
6. The structure defined in claim 3, the said jambs having vertical grooves in their facing sides, nailing strips fitting within said grooves and a frame between said jambs and slabs and attached to said nailing strips.

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